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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/854,673	05/15/2001	Toshimitu Kimura	040679/1263	1146

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EXAMINER
WILKINS III, HARRY D

ART UNIT	PAPER NUMBER
1742	

DATE MAILED: 12/05/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/854,673	KIMURA ET AL.	
	Examiner	Art Unit	
	Harry D Wilkins, III	1742	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *04 November 2002* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-25* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-25* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *15 May 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

1. Claims 1-25 are pending. Claims 8-25 have been added.

2. The rejection under 35 USC 112, first paragraph of claims 1-7 has been withdrawn in view of the amendment filed 04 November 2002.

3. The rejections under 35 USC 103 of claims 1-7 based on the Watari et al reference have been withdrawn.

4. The rejections under 35 USC 103 of claims 1-7 based on the Shibata et al reference have been withdrawn.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

6. Claim 20 is rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for the composition, except for the range of Si, and the method, does not reasonably provide enablement for the entire claimed scope of composition of Si. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the invention commensurate in scope with these claims. The claimed scope of composition could include 0.41 wt% Si, 1.0 wt% Si, 2.0 wt% Si, 5.0 wt% Si or even 10.0 wt% Si. The entire scope of the claimed composition is not been enabled by the specification. In addition, one of ordinary skill in the art would not be able to practice this invention

without undue experimentation in order to find the maximum amount of Si that can be present in the steel.

7. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

8. Claim 20 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

9. The term "relatively small amount" in claim 20 is a relative term which renders the claim indefinite. The term "relatively small amount" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. The scope of the range of Si is not definite.

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

11. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Watari et al (US 5,922,145) in view of "Annealing of Steel".

Watari et al teach a machine structural steel composition. The composition contains (see col 2, lines 50-67) 0.2-0.6 wt% C, 0.05-1.5 wt% Si, 0-2 wt% Ni, 0-2 wt% Cr, 0-0.5 wt% Mo.

Watari et al do not teach that the steel is subjected to spheroidizing.

"Annealing of Steel" teaches (see pages 46-47) that spheroidizing is performed to improve the cold formability of steels. Therefore, it would have been obvious to one of ordinary skill in the art to have applied spheroidizing to the steel of Watari et al for the conventional purpose of improving the cold formability of the steel.

Though Watari et al and "Annealing of Steel" do not teach the function of Cr and Mo as claimed, the values of Cr and Mo disclosed by Watari et al are within the claimed range and one of ordinary skill in the art would have expected the machine structural steel to have the carbides of less than 1 μm average size and less than 3 μm maximum size because the composition taught by Watari et al and the processing step taught by "Annealing of Steel" are identical to the claimed process.

12. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shibata et al (US 4,773,947) in view of "Annealing of Steel".

Shibata et al teach a steel composition that contains (see abstract) 0.03-0.2 wt% C, 1-3 wt% Si, up to 2 wt% Cr, up to 0.5 wt% Mo and up to 2 wt% Ni. The composition of Shibata et al overlaps the presently claimed composition.

Shibata et al do not teach that the steel is subjected to spheroidizing.

"Annealing of Steel" teaches (see pages 46-47) that spheroidizing is performed to improve the cold formability of steels. Therefore, it would have been obvious to one

of ordinary skill in the art to have applied spheroidizing to the steel of Shibata et al for the conventional purpose of improving the cold formability of the steel.

Though Shibata et al and "Annealing of Steel" do not teach the function of Cr and Mo as claimed, the values of Cr and Mo disclosed by Shibata et al are within the claimed range and one of ordinary skill in the art would have expected the machine structural steel to have the carbides of less than 1 μm average size and less than 3 μm maximum size because the composition taught by Shibata et al and the processing step taught by "Annealing of Steel" are identical to the claimed process.

13. Claims 1-3, 5-6, 12-13, 20-22 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Eguchi et al (US 5,746,842) in view of "Annealing of Steel".

Regarding claim 5, Eguchi et al teach a steel composition that contains (see col 2, lines 40-65) 0.1-0.35 wt% C, 0.5-2.5 wt% Si, 0.01-2.5 wt% Cr, 0.01-0.7 wt% Mo and 0.01-2 wt% Ni. The composition of Eguchi et al overlaps the presently claimed composition for every element except C. However, it would have been within the expected skill of a routineer in the art to have optimized the composition of C in the steel in order to maximize the strength of the steel (see col 5, lines 58-59). The upper endpoints of the Cr and Mo ranges are treated as disclosed points. Therefore, Eguchi et al teach a steel with 3.2 wt% Cr+Mo.

Eguchi et al do not teach that the steel is subjected to spheroidizing.

"Annealing of Steel" teaches (see pages 46-47) that spheroidizing is performed to improve the cold formability of steels. Therefore, it would have been obvious to one

of ordinary skill in the art to have applied spheroidizing to the steel of Eguchi et al for the conventional purpose of improving the cold formability of the steel.

Regarding the limitation on the size of the carbides, one of ordinary skill in the art would have expected the carbides formed by the spheroidizing treatment of "Annealing of Steel" to have less than 1 μm average size and less than 3 μm maximum size because the composition taught by Eguchi et al and the processing step taught by "Annealing of Steel" are identical to the claimed process.

Regarding claims 6 and 12, "Annealing of Steel" teaches (see middle column, page 46) that spheroidizing can be heating to a temperature just above Ac_1 followed by very slow cooling in the furnace. Table 4 (see page 47) discloses the general method of spheroidizing for low-alloy steels to obtain a ferritic/spheroidized carbide structure includes heating at about 700-800°C and cooling to about 600°C at a rate of 5°C/hr. Therefore, it would have been obvious to one of ordinary skill in the art to have applied the conventional spheroidizing treatment to the steel of Eguchi et al because the conventional treatment produces a fine ferritic/spheroidized carbide structure in low alloy steels with the improvement in cold formability discussed above.

Regarding claim 1, Eguchi et al teach (as above) a composition that contains the presently claimed composition. One of ordinary skill in the art would have expected the carbides formed by the spheroidizing treatment of "Annealing of Steel" to have less than 1 μm average size and less than 3 μm maximum size as claimed because the composition taught by Eguchi et al and the processing step taught by "Annealing of Steel" are identical to the claimed process.

Regarding claims 2 and 13, the composition of Eguchi et al is identical and the process of "Annealing of Steel" is identical to the claimed composition and method. Therefore, one of ordinary skill in the art would have expected the steel to contain at least one type of carbide selected from MC, M_2C, M_7C_3, $M_{23}C_6$ and M_6C.

Regarding claim 3, "Annealing of Steel" teaches (see Table 4, page 47) that the typical hardness after spheroidizing is 163-212 HB. This converts to about 168-217 HV. Therefore, one of ordinary skill in the art would have expected the steel of Eguchi et al in view of "Annealing of Steel" to have the Vickers hardness as claimed.

Regarding claim 20, though Eguchi et al and "Annealing of Steel" do not teach the function of Cr and Mo as claimed, the values of Cr and Mo disclosed by Eguchi et al are within the claimed range and one of ordinary skill in the art would have expected the machine structural steel to have the carbides of less than 1 μm average size and less than 3 μm maximum size because the composition taught by Eguchi et al and the processing step taught by "Annealing of Steel" are identical to the claimed product.

Regarding claims 21, 22 and 24, the upper endpoints of the Cr and Mo ranges are treated as disclosed points. Therefore, Eguchi et al teach a steel with 3.2 wt% Cr+Mo.

14. Claims 4, 7-11, 14-19, 23 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Eguchi et al (US 5,746,842) in view of "Annealing of Steel" as applied to claims 1-3, 5-6, 12-13, 20-22 and 24 above, and further in view of "Introduction to Surface Hardening of Steels" and "Tempering of Steel".

Regarding claim 7, the teachings of Eguchi et al and "Annealing of Steel" are discussed above in paragraph no. 13.

The method disclosed by "Annealing of Steel" does not include performing carburizing or carbonitriding, followed by tempering, after the spheroidizing.

"Introduction to Surface Hardening of Steels" teaches (see page 259, 1st column) that surface hardening is used to improve the wear resistance of parts without affecting the tough interior of the part. "Introduction to Surface Hardening of Steels" describes, on pages 260-263, the most conventional method of surface hardening, carburizing.

"Tempering of Steel" teaches (see page 121) that tempering is a process that is used on previously hardened steel to increase ductility and toughness.

Therefore, it would have been obvious to one of ordinary skill in the art to have applied carburizing, as taught by "Introduction to Surface Hardening of Steels", and tempering, as taught by "Tempering of Steel", to the steel of Eguchi et al in view of "Annealing of Steel" because the carburizing improves the wear resistance of the surface of the steel and the tempering restores toughness to the surface of the steel.

It would have been within the expected skill of a routineer in the art to have performed machining on the part of Eguchi et al in view of "Annealing of Steel" before the carburizing in order to get the part into the final desired shape before the hard case was formed during carburizing.

Regarding claim 4, because the composition and process taught by Eguchi et al in view of "Annealing of Steel", "Tempering of Steel" and "Introduction to Surface Hardening of Steels" are identical to the presently claimed invention, one of ordinary

skill in the art would have expected the carbides formed by the spheroidizing treatment of "Annealing of Steel" to have less than 1 μm average size and less than 3 μm maximum size as claimed.

Regarding claims 14 and 15, "Annealing of Steel" teaches (see middle column, page 46) that spheroidizing can be heating to a temperature just above Ac_1 followed by very slow cooling in the furnace. Table 4 (see page 47) discloses the general method of spheroidizing for low-alloy steels to obtain a ferritic/spheroidized carbide structure includes heating at about 700-800°C and cooling to about 600°C at a rate of 5°C/hr. Therefore, it would have been obvious to one of ordinary skill in the art to have applied the conventional spheroidizing treatment to the steel of Eguchi et al because the conventional treatment produces a fine ferritic/spheroidized carbide structure in low alloy steels with the improvement in cold formability discussed above.

Regarding claims 8 and 16, the composition of Eguchi et al is identical and the process of "Annealing of Steel" is identical to the claimed composition and method. Therefore, one of ordinary skill in the art would have expected the steel to contain at least one type of carbide selected from MC, M_2C, M_7C_3, $M_{23}C_6$ and M_6C.

Regarding claims 9 and 17, Eguchi et al disclose (see title) that the steel is made into a gear, which is part of a variable transmission.

Regarding claims 10 and 18, "Introduction to Surface Hardening of Steels" teaches the first treatment is used to harden the surface.

Regarding claims 11 and 19, carbonitriding is known to be a functional equivalent to carburizing for the function of surface hardening (see "Introdutcion to Surface

Hardening of Steels" at Table 1 on page 259). Therefore, it would have been obvious to one of ordinary skill in the art to have substituted the known functional equivalent of carbonitriding for the carburizing.

Regarding claims 23 and 25, the upper endpoints of the Cr and Mo ranges are treated as disclosed points. Therefore, Eguchi et al teach a steel with 3.2 wt% Cr+Mo.

Response to Arguments

15. Applicant's arguments filed 04 November 2002 have been fully considered but they are not persuasive. Applicant argued that:

a. Eguchi et al teach a preferred composition that has at most 2.5 wt% Cr+Mo;

b. Eguchi et al fail to teach a specific example within the claimed range of Cr+Mo;

c. It would not have been obvious to one of ordinary skill in the art to have applied spheroidizing to the low carbon steel; and,

d. None of the prior art teaches the function of the Cr and Mo in the steel as claimed.

In response to Applicant's first argument, though the preferred composition limits Cr+Mo to 2.5 wt%, the disclosure of Eguchi et al should not be construed as being limited to only its preferred embodiments.

In response to Applicant's second argument, Eguchi et al disclose upper end points of 2.5 wt% and 0.7 wt% for Cr and Mo, respectively. These end points are

considered to be an actual disclosure of a composition, which falls within the claimed range.

In response to Applicant's third argument, though the reference teaches that spheroidizing is seldom applied to low carbon steels, the teaching is not an express and absolute teaching that it is not done. Therefore, it still would have been obvious to one of ordinary skill in the art to have applied the spheroidizing to the steel of Eguchi et al because the spheroidizing allows for improved cold formability and large deformations (see "Annealing of Steel").

In response to Applicant's fourth argument, the fact that applicant has recognized another advantage which would flow naturally from following the suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious. See *Ex parte Obiaya*, 227 USPQ 58, 60 (Bd. Pat. App. & Inter. 1985).

Conclusion

16. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any

extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

17. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Harry D Wilkins, III whose telephone number is 703-305-9927. The examiner can normally be reached on M-Th 6:00am-4:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy V King can be reached on 703-308-1146. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

Harry D Wilkins, III
Examiner
Art Unit 1742

hdw
December 2, 2002

ROY KING
SUPERVISORY PATENT EXAMINER
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